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TECHNICAL MANUAL

OPERATOR, ORGANIZATIONAL, DIRECT SUPPORT AND GENERAL SUPPORT, MAINTENANCE MANUAL

POWER SUPPLY PP-3940A/G

HEADQUARTERS, DEPARTMENT OF THE ARMY
SEPTEMBER 1971

WARNING

DANGEROUS VOLTAGES EXIST IN THIS EQUIPMENT

High voltages and currents exist in this equipment. Serious injury or death may result from contact with the input or output connections. Deenergize the equipment before connecting or disconnecting the load to be powered.

DON'T TAKE CHANCES!

TECNICAL MANUAL
No. 11–6130–247–14–1

HEADQUARTERS
DEPARTMENT OF THE ARMY
WASHINGTON, D.C., *23 September 1971*

Operator, Organizational, Direct Support, and General Support, Maintenance Manual
POWER SUPPLY PP–3940A/G

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CHAPTER 1

INTRODUCTION

Section I. GENERAL

1-1. Scope

(fig. 1-1)

a. This manual describes Power Supply PP-3940A/G and provides instruction for installation, operation, function, and maintenance. It includes cleaning and inspection of the equipment, and replacement of parts available to each category of maintenance.

b. Appendix A lists the publications applicable to this equipment. Appendix B lists the maintenance allocation of repair operations to be performed at the appropriate maintenance category.

Figure 1-1. Power Supply PP-3940A/G, less running spares.

1-2. Indexes of Publications

a. DA Pam 310-4. Refer to DA Pam 310-4 to determine whether there are new editions, changes, or additional publications pertaining to the equipment.

b. DA Pam 310-7. Refer to DA Pam 310-7 to determine whether there are modification work orders (MWO's) pertaining to the equipment.

1-3. Forms and Records

a. Reports of Maintenance and Unsatisfactory Equipment. Use equipment forms and records in accordance with instructions in TM 38-750.

b. Report of Packaging and Handling Deficiencies. Fill out and forward DD Form 6 (Report of Packaging and Handling Deficiencies) as prescribed in AR 700-58 (Army)/NAVSUP PUB 378 (Navy)/AFR 71-4 (Air Force)/ and MCO P4030.29 (Marine Corps.).

c. Discrepancy in Shipment Report (DISREP) (SF 361). Fill out and forward Discrepancy in Shipment Report (DISREP) (SF 361) as prescribed in AR 55-38 (Army)/NAVSUP PUB 459 (Navy)/AFM 75-34 (Air Force)/ and MCO P4610.19 (Marine Corps.).

d. Reporting of Equipment Manual Improvements. Reporting of errors, omissions, and recommendations for improving this manual by the individual user is encouraged. Reports should be submitted on DA Form 2028 (Recommended Changes to Publications) and forwarded direct to Commanding General, U.S. Army Electronics Command, ATTN: AMSEL-ME-NMP-EM, Fort Monmouth, N.J. 07703.

e. Administrative Storage. For procedures, forms and records, and inspection requirements during administrative storage of equipment, refer to TM 740-90-1.

Section II. DESCRIPTION AND DATA

1-4. Purpose and Use

Power Supply PP-3940A/G (fig. 1-1) converts 115-volt alternating current (ac) single-phase power, to from 0- to 40-volt direct current (dc) power at a maximum of 4 amperes. The power supply has the additional capabilities of regulating the output voltage at the load rather than at the power supply output terminals (remote sensing); producing specific values of output voltage or current by connecting appropriate resistances to rear terminal board terminals (voltage and current programing). This power supply may be used whenever a precise, regulated voltage (40 volts maximum) or current (4 amperes maximum) supply is specified.

1-5. Technical Characteristics

Power input:

Voltage	115 volts ±10.
Phase	Single.
Frequency	50 to 400 Hz.
Current	3.5 amperes maximum.

Power output:

Voltage	0 to 40 volts dc.
Current	0 to 4 amperes.
Regulation	0.01% maximum.
Ripple	1 millivolt rms maximum.
Ambient temperature	−20° C (−4° F to 50° C (122° F).
Weight	26 pounds.

1-6. Components

a. Component.

Federal stock No.	Component	Quantity	Height (in.)	Depth (in.)	Width (in.)	Weight (lb)
6130-460-2148	Power Supply PP-3940A/G	1	5	16⅛	8⅛	26

b. Running Spares.

Federal stock No.	*Quantity*	*Item*
5920-296-1519	1	Fuse, cartridge (F1, 5 ampere)
6240-683-0560	2	Lamp, incandescent (DS2 and DS3)

1-7. Description of Equipment

The power supply is a self-contained, portable unit housed in a metal case with a one-piece top and side cover, and an attached power cable. The top and side cover can be easily removed to facilitate maintenance on the power supply. The power cable is terminated in a heavy-duty, three-wire connector plug. All operating controls are mounted on the front panel. A carrying handle is provided to facilitate repositioning of the power supply. Vents on each side and the top are provided for air circulation.

CHAPTER 2

INSTALLATION AND OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF EQUIPMENT

2-1. Unpacking

(fig. 2-1)

a. Packaging Data. When packed for shipment, Power Supply PP-3940A/G is placed in a carton and packed in a 7- by 19- by 11-inch outer corrugated carton. A typical packaging diagram is shown in figure 2-1. The volume is 0.85 cubic foot and the total weight is 35 pounds.

b. Removing Contents.

(1) Cut the waterproof tape that seals the top of the shipping carton.

(2) Remove the inclosed cardboard carton.

(3) Cut the waterproof tape that seals the top of the cardboard carton.

(4) Open the moisture and vaporproof barrier in the cardboard container.

(5) Remove the enclosed cardboard carton.

(6) Cut the waterproof tape that seals the top of the cardboard carton.

(7) Remove the humidity indicator, the desiccant, and the pads.

(8) Remove the power supply.

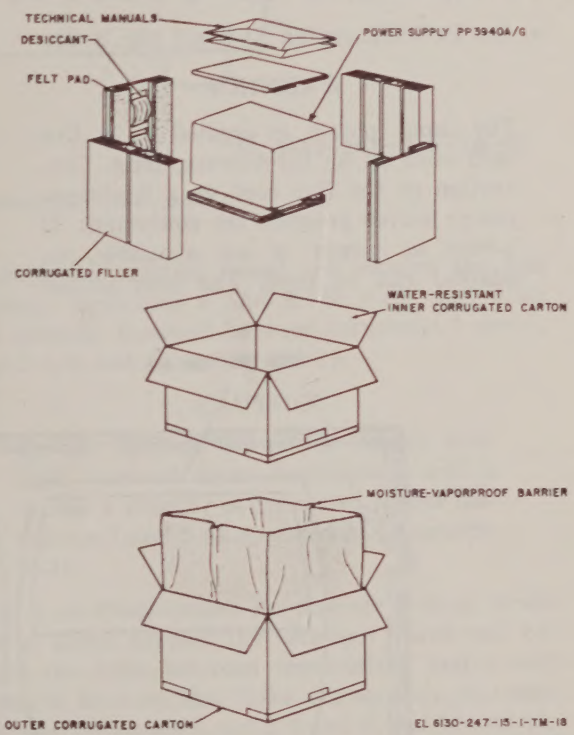


Figure 2-1. Power Supply PP-3940A/G, packaging diagram.

2-2. Checking Unpacked Equipment

a. Inspect the equipment for damage incurred during shipment. If the equipment has been damaged, report the damage on DD Form 6 (para 1-3).

b. See that the equipment is complete as listed on the packing slip. If a packing slip is not available, check the equipment against the components data given in paragraph 1-6. Report all discrepancies in accordance with TM 38-750. Shortage of a minor assembly or part that does not affect proper functioning of the equipment should not prevent use of the equipment.

c. If the equipment has been used or reconditioned, see whether it has been changed by a modification work order (MWO). If the equipment has been modified, the MWO number will appear on the front panel near the nomenclature plate. If modified, see that any operational instruction changes resulting from the modification have been entered in the equipment manual.

NOTE

Current MWO's applicable to the equipment are listed in DA Pam 310-7.

2-3. Installation

a. All semiconductors, the fuse, terminal board links, and indicator lamps are installed in the power supply when the equipment is shipped.

b. See that a 5.0-ampere fuse is installed in the fuse holder at the rear of power supply (fig. 2-3).

c. See that all terminal board screws are present and links are tightly connected between terminals 1 and 2, 3 and 4, 5 and 6, 8 and 9, and 10 and 11 on rear terminal board (fig. 2-3).

d. The power supply is a bench-type unit and needs no installation.

2-4. Preparation for Use

a. Set POWER switch S1 to off (fig. 2-2).

WARNING

The input power is applied by a line cord with an ac three-prong plug. Connection of the line cord to a 3-wire ac power source grounds the equipment. If 3-wire ac power is not available, an adapter can be used. The user should make sure that the extra wire (coded green) coming out from the adapter is solidly grounded to the ac power source wiring system, preferably soldered.

b. Plug the power cord connector into a 115-volt ac, 60-Hertz (Hz) power source.

c. Make the necessary load connections to the binding posts as specified by the local requirements.

2-5. Terminal Board Links

Terminal board links connect portions of the interior power supply circuitry. When the power supply is used in any of its modes of operation, some portions of the internal circuitry must be disconnected by removing specific terminal board links. The operator must insure that the correct combination of links is securely fastened to the proper terminals.

a. Link Combination for Constant Voltage,

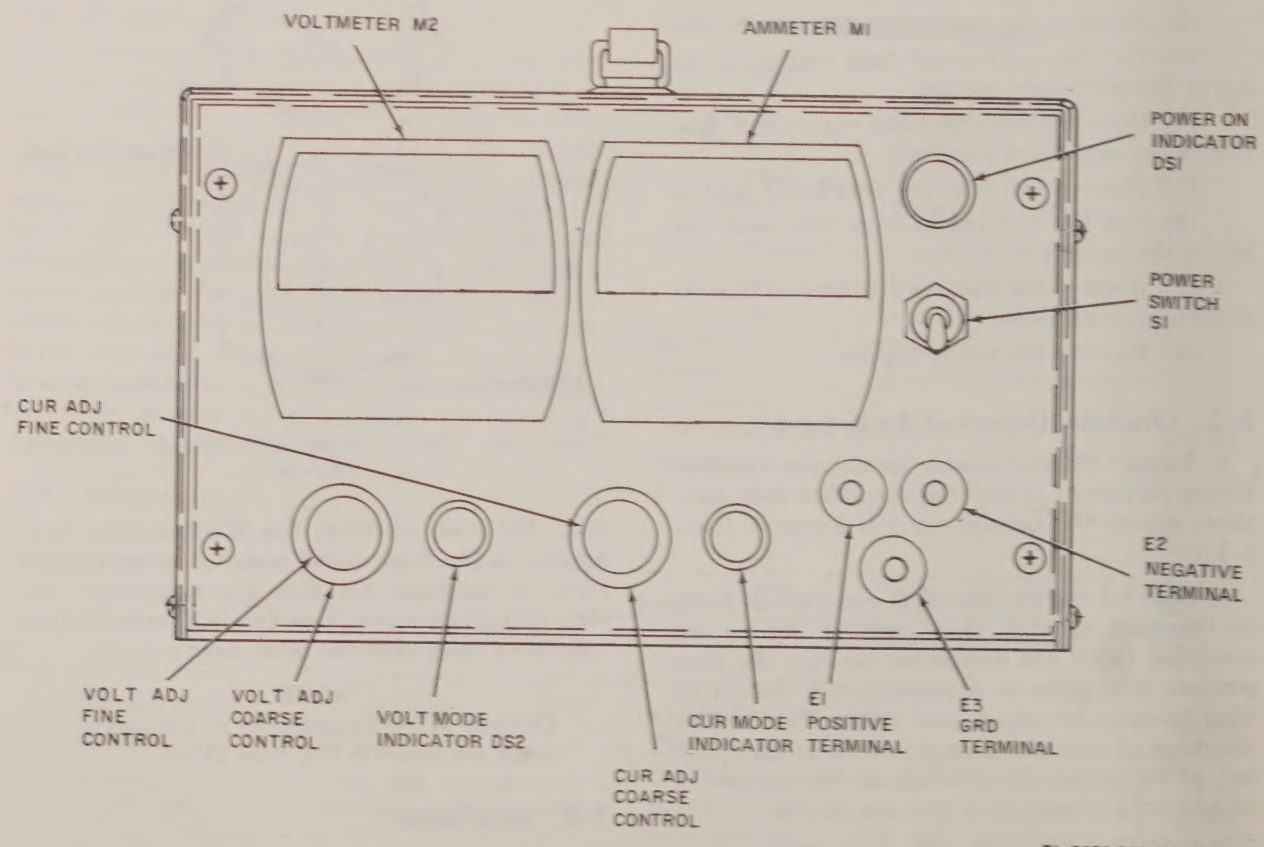


Figure 2-2. Power Supply PP-3840A/G, front panel controls and indicators.

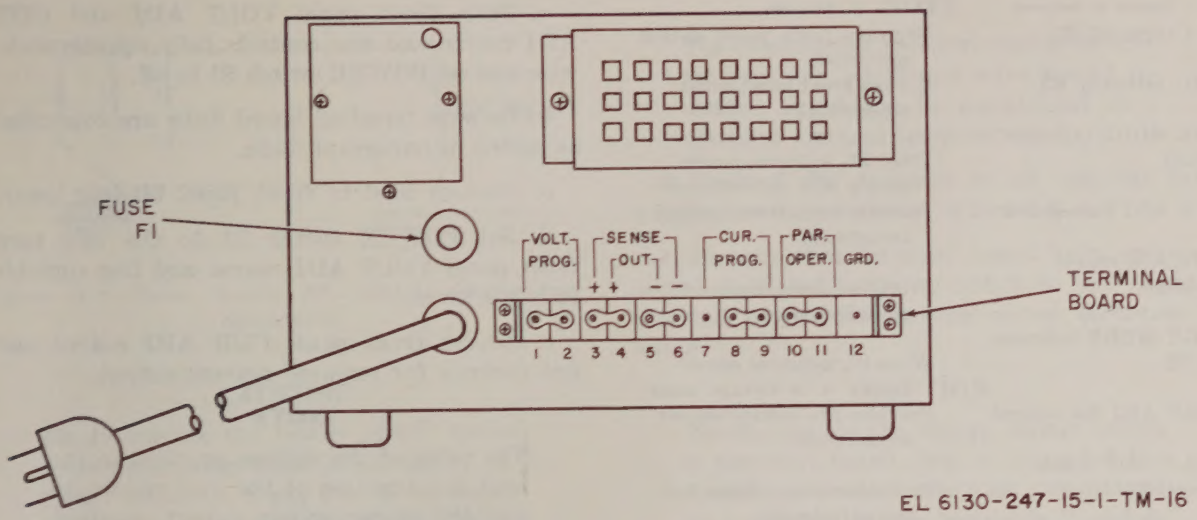


Figure 2–3. Power Supply PP–3940A/G, rear panel.

Constant Current, or Predetermined Values of Current and Voltage. Inpect the terminal board and insure that links are securely fastened between terminals 1 and 2, 3 and 4, 5 and 6, 8 and 9, and 10 and 11.

CAUTION

Do not operate the power supply unless all the links are present and securely fastened.

b. Link Combination for Voltage Programing. Inspect the terminal board and remove the link between terminals 1 and 2. Be sure that links are securely fastened between terminals 3 and 4, 5 and 6, 8 and 9, and 10 and 11.

CAUTION

Do not operate the power supply with link removed from terminals 1 and 2 unless a resistor is connected across terminals 1 and 3 as specified in paragraph 2–9.

c. Link Combination for Current Programing. Inspect the terminal board and remove the link between terminals 8 and 9. Be sure that links are securely fastened between terminals 1 and 2, 3 and 4, 5 and 6, and 10 and 11.

CAUTION

Do not operate the power supply with link removed from terminals 8 and 9 unless a resistor is connected across terminals 7 and 9 as specified in paragraph 2–10.

d. Link Combination for Remote Voltage Sensing at Load. Inspect the terminal board and remove the links between terminals 3 and 4 and 5 and 6. Be sure that links are securely fastened between terminals 1 and 2, 8 and 9, and 10 and 11.

CAUTION

Do not operate power supply with links removed from terminals 3 and 4 and 5 and 6 unless a load is connected by individual connections to each of these terminals as specified in paragraph 2–11.

Section II. OPERATING INSTRUCTIONS

2–6. Controls and Indicators

a. Front Panel Controls and Indicators (fig. 2–2).

Control or indicator	*Function*
Voltmeter M2	Indicates output voltage.
Ammeter M1	Indicates output current.
POWER ON indicator DS1	When lit, indicates primary power is applied.
POWER switch S1	In ON position, connects 115-volt ac, single-phase power to power supply.
(–) terminal E2	Positive front panel output connection.

Control or indicator	*Function*
(+) terminal E1	Negative front panel output connection.
GND terminal E3	Ground front panel output connection.
CUR MODE indicator DS3	When lit, indicates power supply is in current mode.
CUR ADJ fine control	Provides fine current output adjustment.
CUR ADJ coarse control	Provides coarse current output adjustment.
VOLT MODE indicator DS2	When lit, indicates power supply is in voltage mode.
VOLT ADJ fine control	Provides fine voltage output adjustment.
VOLT ADJ coarse control	Provides coarse voltage output adjustment.

b. Rear Panel Controls (fig. 2–3).

Control	*Function*
Fuse F1	Protects the ac input power from overload.
Terminal board TB1	Connects various portions of the power supply internal circuitry. Links may be removed for different modes of operation.

2–7. Power Supply Setup Procedures for Constant Voltage Output

If the power supply is to be used as a constant voltage source, proceed as follows:

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set POWER switch S1 to Off.

b. Be sure terminal board links are connected as stated in paragraph 2–5*a*.

c. Connect load to front panel binding posts.

d. Set POWER switch S1 to ON and turn front panel CUR ADJ coarse and fine controls fully clockwise.

e. Adjust front panel VOLT ADJ coarse and fine controls for required constant voltage output.

NOTE

The value of the current supplied to the load is a function of the load resistance and the power supply constant output voltage.

2–8. Power Supply Setup Procedures for Constant Current Output

If the power supply is to be used as a constant current source, proceed as follows.

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set POWER switch S1 to off.

b. Be sure terminal board links are connected as stated in paragraph 2–5*a*.

c. Connect load to front panel binding posts.

d. Set POWER switch S1 to ON and turn front panel VOLT ADJ coarse and fine controls fully clockwise.

e. Adjust front panel CUR ADJ coarse and fine controls for required current output.

NOTE

The value of the voltage supplied to the load is a function of the load resistance and the power supply output constant current.

2–9. Power Supply Setup Procedures for Voltage Programing

Voltage programing is used when the operator wishes to switch from one set constant voltage output to another without returning to the power supply each time. To set up the power supply for voltage programing, proceed as follows:

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set POWER switch S1 to off.

b. Determine the value of voltages to be used; for example, voltage levels of 28 volts dc, 12 volts dc, and 6 volts dc.

c. Multiply the value of each voltage to be used by 100. This will give the value of the resistor that must be placed across terminal board VOLT PROG terminals (terminal numbers 1 and 2). *For example*, from *b* above, 28 volts × 100 = 2,800 ohms; 12 volts × 100 = 1,200 ohms; 6 volts × 100 = 600 ohms.

NOTE

The programing resistors should be low-temperature, coefficient wire-wound resistors or should be maintained at a constant ambient temperature.

d. Connect the resistors to an external programing switch as shown in figure 2–4.

e. Be sure that terminal board links are connected as stated in paragraph 2–5*b* and connect external programing switch and resistors across terminals 1 and 3.

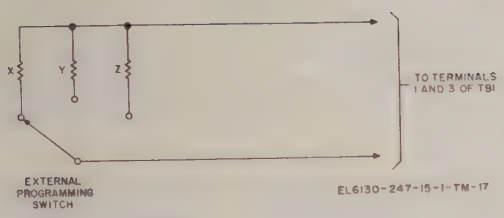


Figure 2–4. Power Supply PP–3940A/G, programing connections.

CAUTION

Never operate the power supply unless a terminal board link is connected between terminals 1 and 2 or a resistance is connected across terminals 1 and 3.

f. Connect power supply to the load.

g. Set power supply POWER switch to ON. Adjust front panel CUR ADJ coarse and fine controls fully clockwise.

NOTE

The front panel VOLT ADJ controls are inoperative during voltage programing.

h. Be sure that resistors are removed and terminal board links are reconnected when voltage programing is no longer required.

2–10. Power Supply Setup Procedures for Current Programing

Current programing is used when the operator wishes to switch from one set output constant current to another, without returning to the power supply each time. To set up the power supply for current programing, proceed as follows:

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set POWER switch S1 to off.

b. Determine the value of current to be used; for example, current levels of 2.5 amperes dc, 1 ampere dc, and 0.5 ampere dc.

c. Multiply the value of each current to be used by 50. This will give the value of the resistor that must be placed across terminal board CUR PROG terminals (7 and 0.) *For example,* from *b* above, 2.5 × 50 = 125 ohms; 1 × 50 = 50 ohms; 0.5 × 50 = 25 ohms.

NOTE

The programing resistors should be low-temperature, coefficient wire-wound resistors, or should be maintained at a constant ambient temperature.

d. Connect the resistors to an external programing switch as shown in figure 2–4.

e. Be sure that terminal board links are connected as stated in paragraph 2–5*c* and connect external programing switch across terminals 7 and 9.

CAUTION

Never operate the power supply unless a terminal board link is connected between terminals 8 and 9 or a resistance is connected across terminals 7 and 9.

f. Connect power supply to the load.

g. Set power supply POWER switch to ON Adjust front panel VOLT ADJ coarse and fine controls fully clockwise.

NOTE

The front panel CUR ADJ controls are inoperative during voltage programing.

h. Be sure that resistors are removed and terminal board link are reconnected when current programing is no longer required.

2–11. Power Supply Setup Procedures for Remote Sensing at Load

Remote sensing is used to regulate the output voltage at the load rather than at the output terminals of the power supply. To set up the power supply for remote sensing, proceed as follows:

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set POWER switch S1 to off.

b. Be sure that terminal board links are connected as stated in paragraph 2–5*d.*

c. Connect separate leads from terminals 3 (+SENSE lead) and 4 (+OUT lead) to the positive side of the load, and separate leads from terminals 5 (−OUT lead) and 6 (−SENSE lead) to the negative side of the load (fig. 2–5).

NOTE

The leads (25 feet maximum) from terminals 4 and 5 must be capable of handling 4 amperes of current flow. The

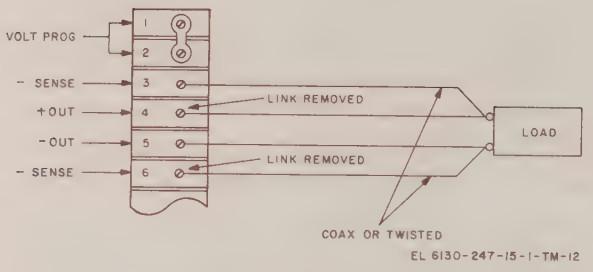


Figure 2-5. Power Supply PP-3940A/G, connections for remote sensing.

leads from terminals 3 and 6 should be either a coaxial pair or twisted pair in order to minimize stray pickup, which might result in power supply instability.

d. Set POWER switch S1 to ON and turn front panel CUR ADJ coarse and fine controls fully clockwise.

e. Adjust front panel VOLT ADJ coarse and fine controls for required constant voltage output.

2-12. Power Supply Setup Procedures When Specific Values of Voltage and Current Are Required

When power supply output requirements specify both a constant voltage and a specific current that is not to be exceeded, or both a constant current and a specific voltage that is not to be exceeded, proceed as follows.

a. Turn front panel VOLT ADJ and CUR ADJ coarse and fine controls fully counterclockwise and set power supply POWER switch S1 to off.

b. Determine the limits of voltage and current to be supplied by the power supply. *For example,* constant voltage of 28 volts dc with current not to exceed 1.5 ampere dc.

c. Be sure that terminal board links are connected as stated in paragraph 2-5*a*.

d. Connect load to front panel terminals.

e. Set power supply POWER switch to ON.

f. Set the *not to exceed* value (either current or voltage), using the front panel coarse and fine controls and meter. (For the example given in *b* above, turn the CUR ADJ coarse and fine controls for a reading of 1.5 ampere on ammeter.)

g. Set the constant value (either current or voltage) using the front panel coarse and fine controls and meter. (For the example given in *b* above, turn the VOLT ADJ coarse and fine controls for a reading of 28 volts on voltmeter.)

NOTE

When the power supply is set up in this manner, there may be a flickering between VOLT MODE and CUR MODE lamps when operating at the *not to exceed* value.

CHAPTER 3

PREVENTIVE MAINTENANCE INSTRUCTIONS

3-1. Scope of Preventive Maintenance

Preventive maintenance is the systematic care, servicing, and inspection of equipment to prevent the occurrence of trouble, to reduce downtime, and to assure that the equipment is serviceable.

a. Systematic Care. The procedures given in paragraphs 3-2 and 3-3 cover routine systematic care and cleaning essential to proper upkeep and operation of the equipment.

b. Preventive Maintenance Checks and Services. The preventive maintenance checks and services chart (para 3-2) outlines functions to be performed at specific intervals. These checks and services are to maintain Army electronic equipment in a combat serviceable condition; that is, in good general (physical) condition and in good operating condition. To assist operators in maintaining combat serviceability, the chart indicates what to check, how to check, and the normal indications. The *References* column lists the paragraphs or manuals that contain detailed repair or replacement procedures. If the defect cannot be remedied by performing the corrective actions listed, higher category of maintenance or repair is required. Records and reports of these checks and services must be made in accordance with the requirements set forth in TM 38-750.

3–2. Preventive Maintenance Checks and Services Chart

Item number	Interval						B—Before operation D—During operation	A—After operation W—Weekly	M—Monthly Q—Quarterly
	Operator			Org					
	Daily			W	M	Q	Item to be inspected	Procedure	Reference
	B	D	A						
1	X						Completeness	See that equipment is complete	Para 1–6.
2	X						Panel	Clean and check meter glass and indicator lenses for cracks.	Para 3–3.
3	X						Connectors	Check tightness.	
4		X					Controls and indicators	See that mechanical action is smooth and check meter for sticking or bent pointer.	
5		X					Operation	Operate equipment according to chapter 2.	
6				X			Cables, cords, wires	Inspect for chafed, cracked, or frayed insulation. Replace connectors that are broken, arced, stripped, or worn excessively.	
7				X			Handle	Inspect for looseness. Replace or tighten as necssary.	
8				X			Metal surfaces	Inspect for rust and corrosion. Touch up paint as required.	Para 3–4.
9					X		Pluckout item	Inspect seating.	
10					X		Jacks	Inspect for snug fit and good contact.	
11					X		Transformer	Inspect for tight nuts and absence of dirt or corrosion.	
12					X		Resistors and capacitors	Inspect for cracks, blistering, or other defects.	
13						X	Publications	See that all publications are complete, serviceable, and current.	DA Pam 310–4.
14						X	Modifications	Determine if new applicable MWO's have been published. All URGENT MWO's must be applied immediately. All NORMAL MWO's must be scheduled.	TM 38–750 and DA Pam 310–7.
15						X	Spare parts	Check for general condition and method of storage. No overstock should be evident and all shortages must be on valid requisitions.	Para 1–6*b*.

3-3. Cleaning

Inspect the exterior of the equipment. The exterior surfaces should be free of dust, grease, and fungus.

a. Remove dust and loose dirt with a clean, soft cloth.

WARNING

The fumes of trichloroethane are toxic. Provide thorough ventilation whenever used. DO NOT use near an open flame. Trichloroethane is not flammable, but exposure of the fumes to an open flame converts the fumes to highly toxic, dangerous gases.

b. Remove grease, fungus, and ground-in dirt from the case; use a cloth dampened (not wet) with trichloroethane.

c. Remove dirt or dust from plugs and jacks with a brush.

CAUTION

Do not press on the meter face (glass) when cleaning; the meter may become damaged.

d. Clean the front panel, meters, and control knobs; use a soft, clean cloth. If necessary, dampen the cloth with water; mild soap may be used for more effective cleaning.

3-4. Touchup Painting Instructions

Remove rust and corrosion from metal surfaces by lightly sanding them with fine sandpaper. Brush two thin coats of paint on the bare metal to protect it from further corrosion. Refer to the applicable cleaning practices specified in TB 746-10.

3-5. Organizational Troubleshooting

a. General. The troubleshooting procedure will help the repairman to locate the trouble quickly and apply the proper corrective measures. If the measures suggested do not restore normal equipment performance, troubleshooting is required by higher maintenance category repairman. Note on the repair tag what corrective measures were taken and how the equipment performed at the time of failure.

b. Procedure. Perform the steps in *c* below. Observe the equipment operation and perform any corrective measures necessary.

c. Troubleshooting Procedure

Symptom	*Probable cause*	*Corrective measures*
1. POWER ON indicator lamp does not light.	*a.* Defective fuse F1 *b.* Defective power lamp *c.* Defective transformer or rectifier stage.	*a.* Replace fuse. *b.* Replace lamp. *c.* Refer to higher category of maintenance.
2. In voltage mode, VOLT MODE indicator lamp does not light.	*a.* Defective lamp *b.* Defective regulating stage	*a.* Replace lamp. *b.* Refer to higher category of maintenance.
3. In current mode, CUR MODE indicator lamp does not light.	*a.* Defective lamp *b.* Defective regulating stage	*a.* Replace lamp. *b.* Refer to higher category of maintenance.
4. Erratic indicator movement of current or voltage meter.	Defective preregulation	Refer to higher category of maintenance.

3-6. Removal and Replacement of Lamp and Fuse

a. VOLT and CUR Mode Indicator Lamps.

NOTE

POWER lamp DS1 replacement is accomplished at higher category of maintenance.

(1) Turn plastic indicator cover counterclockwise and pull out to expose defective lamp.

(2) Unscrew defective lamp.

(3) Install new lamp and reinstall indicator cover.

b. Fuse (F1).

(1) Turn fuse cap counterclockwise and pull it out to expose defective fuse.

(2) Pull defective fuse out and replace it with a new one. Push new fuse in and install fuse cap.

CHAPTER 4

FUNCTIONING OF EQUIPMENT

4-1. General

a. The power supply is a variable-output, voltage-regulated, current-regulated dc supply. The characteristics of this type of regulated power supply exhibits a crossover point at which the supply switches from voltage regulation, indicated by the front panel VOLT MODE indicator being lit, to current regulation, indicated by the front panel CUR MODE indicator being lit. Figure 4-1 indicates this crossover point as a function of the preset value of the front panel VOLT ADJ and CUR ADJ controls. *For example*, setting the front panel controls for 20 volts dc and 2 amperes and using Ohm's Law:

$$R = \frac{E}{1} = \frac{20}{2} = 10 \text{ ohms.}$$

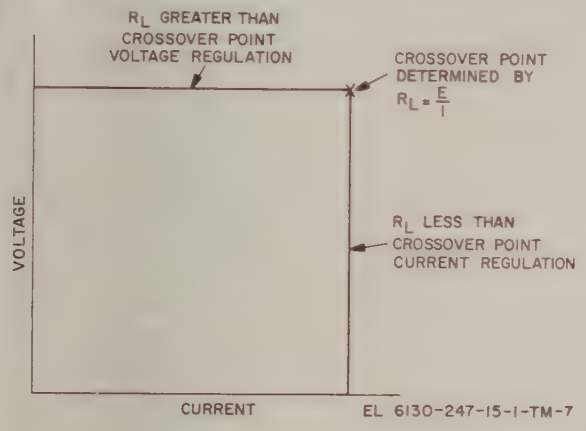


Figure 4-1. Power Supply PP-3940A/G, crossover characteristics.

b. If the value of the load resistance is 10 ohms or more, the power supply will regulate the output voltage at 20 volts dc and the VOLT MODE indicator will be lit. If the load resistance is less than 10 ohms, the power supply must produce more than 2 amperes of current to regulate the output to 20 volts dc. At this point, the VOLT MODE indicator extinguishes, the CUR MODE indicator lights, and the current is regulated to the set value of 2 amperes.

4-2. Block Diagram Analysis
(fig. 4-2)

a. Input power is applied to the primary side of transformers T1 and T2. The secondary voltage of T1 is applied to a full-wave, solid-state rectifier with capacitor filtering. The rectified voltage is applied to a dc switching-type preregulator which breaks up the dc voltage into pulses. The output voltage is determined by the relation of on-time to off-time of this switch. The series switch arrangement is a very efficient device, but it has a slow response time to any detected errors in the output. The response time is increased by providing a linear series passing network which provides instantaneous correction for output error.

b. Under normal conditions, a short circuit across the output will drive the series regulator into current mode operation, holding the short circuit current to the preset value of the CUR ADJ controls. However, if a series passing stage in the series regulator is shorted, in addition to the external short circuit, the combination will produce a damaging amount of current through the preregulators. An overcurrent protection network is provided to sense this condition and will short out the preregulator circuitry, relieving the preregulator elements of all current.

c. The ability of the voltage and current regulating circuitry to detect errors is dependent upon the ability of the reference supply to provide precise voltages to the regulating circuitry. The regulating circuits are differential amplifiers which depend on a constant voltage being supplied to one side of the circuit to detect errors in the output.

4-3. Detailed Circuit Analysis

a. Rectification and Preregulation. The 115-volt ac, single-phase, 60- to 400-Hertz input is applied through POWER switch S1 and fuse F1 to primary of transformers T1 and T2. The secondary of T1 is connected to full-wave rectifier

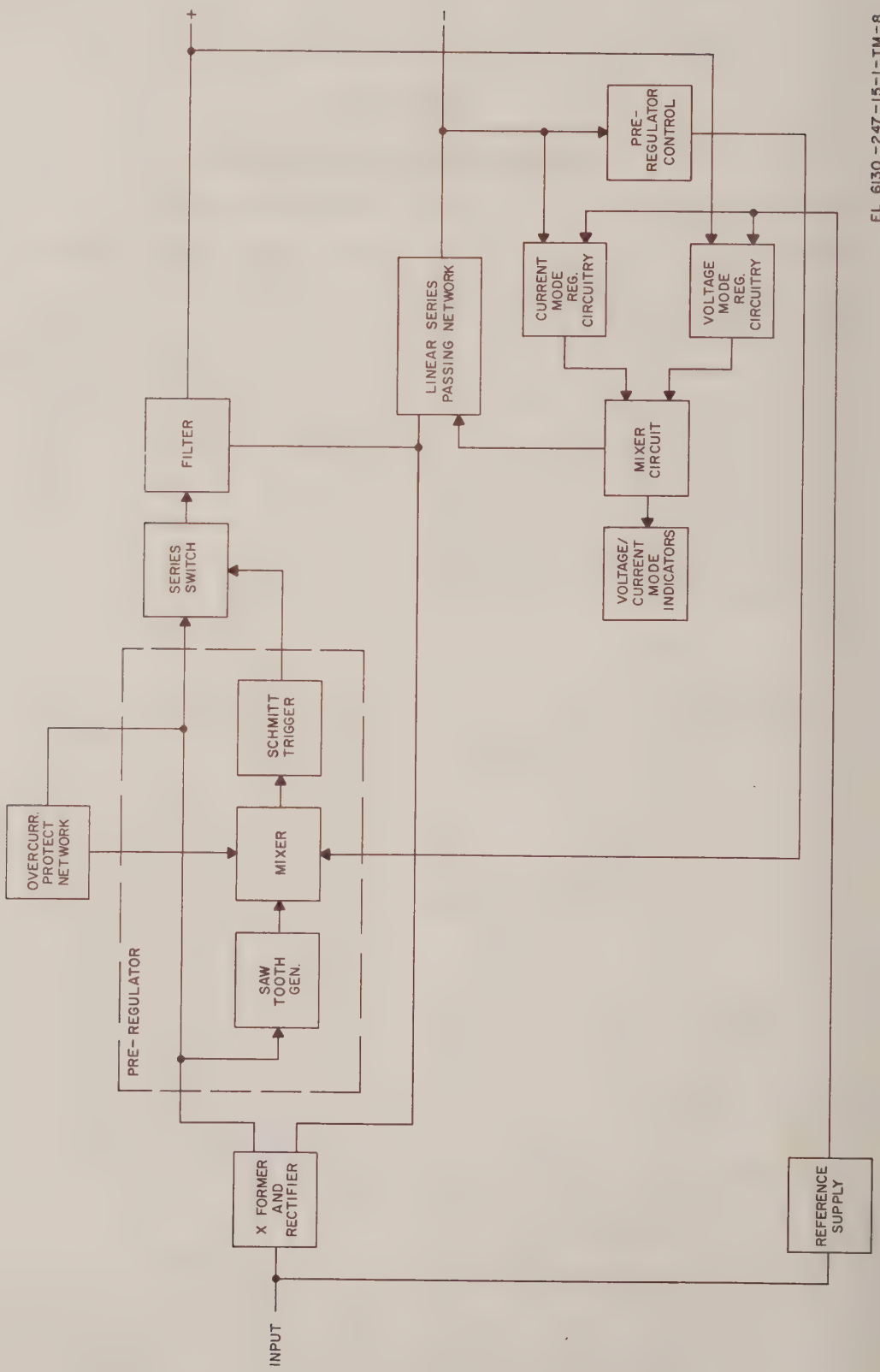


Figure 4-2. Power Supply PP-3940A/G, block diagram.

and filter circuit C1, CR1 through CR4, and C2. There are three secondary windings of transformer T2. One secondary winding (pins 10, 12, and 14) supplies bias to the Darlington connection of series switch transistors Q10 and Q9. The second secondary winding (pins 6, 7, and 8) of transformer T2 supplies back bias to the Darlington connection of Q15, Q14 and Q13. The third secondary winding (pins 4, 5 and 15) of transformer T2 supplies power to the auxiliary power supply consisting of differential amplifier A3Q25 and associated circuitry, second differential amplifier A3Q23, A3Q24 and associated circuitry and series regulator circuit A3Q22, A3Q21 and associated circuitry. The output of the full-wave rectifier is used to supply operating voltage to the preregulator by applying the rectified voltage to zener diode A4CR29 and resistor A1R90 in series. This produces a 15-volt dc potential to be used by the preregulator without disturbing the full output voltage of the rectified dc. Resistor A4R2 provides bias for unijunction transistor A4Q1 which will be used as an oscillator. Resistors A4R3 and A4R4 and capacitor A4C4 produce a charging time constant to the gate of A4Q1. As the positive charge on A4C4 increases, a point is reached which forward biases A4Q1. Capacitor A4C4 then discharges through A4Q1 which reduces the positive charge of capacitor A4C4. Transistor A4Q1 turns off and the cycle is repeated. Resistor A4R4 is used to vary the time required for A4C4 to charge to the forward bias point. This sawtooth output of capacitor A4C4 is coupled through resistor A4R5 to emitter-follower transistor A4Q2 and its associated circuitry. The signal output across resistor A4R7 is coupled to the mixer amplifier circuitry by capacitor A4C7. Mixer amplifiers A4Q3 and A4-Q4 and associated circuitry provide a means of injecting a dc bias, proportional to detected error in output voltage or current, to control the time required for the dc signal combined with the sawtooth signal, to fire the Schmitt trigger composed of A4Q5, A4Q6, and associated circuitry. The output frequency of the Schmitt trigger will remain constant (that is, same as the sawtooth frequency), but the pulse width will vary. The Schmitt trigger output pulses are amplified by transistor A4Q7 and applied to driver transistor A4Q8 which will switch Darlington-connected series switch transistors Q10 and Q9 on and off. As the on time of the series switch transistors increases, the output voltage and current increase. The switched output is filtered by inductor L1 and series resistance-capacitance (rc) network R33 and C13. Resistor R36 maintains a minimum load across the preregulator output.

b. Current Overload Protection. If a series regulator passing stage develops a short circuit, a heavy load or short circuit at the output of the power supply will result in a significant increase in the current through the series switch. This increase in current is sensed by resistor R28. The voltage drop across R28 increases and forward-biases transistor A4Q38 which then applies a positive voltage to the Schmitt trigger input, shutting it off. The reaction time of this circuit is in microseconds. If the transient or short circuit persists, capacitor A4C41 begins charging. When the positive charge across A4C41 reaches the breakdown voltage of Zener diode A4CR32, the zener diode allows this positive voltage to be applied to the control gate of silicon-controlled rectifier A4CR31, allowing it to conduct. A4CR31 then shorts out the preregulator, removes all current from series switch transistors Q9 and Q10, and drops the output voltage and current to zero. The only way A4CR31 can be reset is to remove input power.

c. Voltage Regulation Circuitry. The power supply output voltages is sensed by voltage divider R59A and R59B, which are the front panel VOLT ADJ controls, and A3R60. This divided-down sample of the output voltage is applied to A3Q-36, which is one-half of a differential amplifier. The other half, A3Q35, is supplied with a constant reference voltage. The bases of transistors A3Q35 and A3Q36 receive a constant current supply from transistor A3Q34 and associated circuitry. Any error sensed by the differential amplifier is applied to a second differential amplifier composed of A3Q32, A3Q33 and associated circuitry. Capacitors A3C24 and A3C25 are used to insure that the differential amplifier will not oscillate under any line of load conditions. Variations in A3Q32 collector current are coupled via A3Q31 into the base of Q15. The base bias of Q15 is constant current generator A3Q30 and its associated circuitry. Transistor A3Q31 operates in the saturated condition during voltage mode operation and has no affect on Q15 bias. The change in Q15 bias controls the drive current for the Darlington connection linear series regulator, changing the impedance of Q13. This provides instantaneous correction of an existing error, and thus holds the output voltage constant. To provide proper voltage drop across series pass regulator Q13 without excessive heating, it is necessary to maintain the Q13 voltage drop essentially

constant at 5 volts dc. (A3Q20 and A4Q4 act to detect any voltage variation across Q13 network R37, Q13, R39, and R52.) The A3Q20 base is biased by a reference voltage (A3CR20 and potentiometer A3R57) at approximately 5 volts dc below the output voltage.

The emitter of A3Q20 transfers this voltage to the base of Q4. The emitter of A4Q4 senses the input voltage to the series regulator stage at the junction of R33 and R37. Any difference between the base and emitter voltages of A4Q4 will be proportional to the error existing between the A3Q20 reference voltage and series stage voltage drop. The collector of A4Q4 determines the dc bias to the Schmitt trigger which determines the proper on–off time of the series switch. Thus, the preregulator output voltage is corrected so that the Q13 voltage drop is held constant at 5 volts dc.

d. Current Regulation Circuitry. Current is regulated by sensing the voltage drop across resistor R52. Since resistor R52 is in series with the output load, the amount of current flowing through the load also flows through this close tolerance resistor. The voltage drop across resistor R52 then represents the current through the load. This voltage drop is compared to a reference voltage (voltage divider R53A and R53B, the front panel CUR ADJ controls, and R54 and A3R55, across zener diode A3CR20). The reference voltage is applied to A3Q19 which is one half of differential amplifier A3Q18, A3Q19, and associated circuitry. The R52 voltage drop is applied to A3Q18. Resistor A3R50 is used to balance the differential amplifier. Any detected error is applied to a second differential amplifier composed of A3Q16, A3Q17, and associated circuitry. The amplifier error signal changes the collector potential of A3Q16, which changes the bias of A3Q31 through diodes A3CR24A and A3CR24B. Changing the bias of A3Q31 affects the bias of Q15, which is the driver of the Darlington-connected linear series regulator, changing the impedance of Q13. Transistor Q13 provides instantaneous correction of the error and thus holds the current constant. The voltage drop across Q13 is held constant by the same method discussed in *c* above.

CHAPTER 5

DIRECT SUPPORT, GENERAL SUPPORT, AND DEPOT MAINTENANCE

WARNING

When servicing the power supply, be extremely careful of the high voltages.

5-1. Scope of Maintenance

Troubleshooting at the direct support, general support, and depot maintenance categories includes all the techniques outlined for organizational maintenance and any special or additional techniques required to isolate a defective part. Paragraph 5-4*d* provides the troubleshooting chart to be used by the repairman.

5-2. Test Equipment Required

The following chart lists the test equipment required for troubleshooting Power Supply PP-3940A/G. It also lists the associated technical manuals.

Test equipment	*Technical manual*
Multimeter TS-352B/U	TM 11-6625-366-15
Transformer, Variable Power TF-171A.	None
Resistor, Decade ZM-16/U	None
Counter, Electronic, Digital Readout AN/USM-207A.	TM 11-6625-700-10
Oscilloscope AN/USM-117	TM 11-6625-640-15
Voltmeter, Digital AN/GSM-64	TM 11-6625-444-15
Test Set, Transistor TS-1836B/U.	TM 11-6625-539-15
Resistor, variable, wire wound (0- to 7.5-ohm, 1,000-watt, FSN 5905-195 4496, for use as load).	

5-3. Sectionalization, Localization, and Isolation

a. Sectionalization. The first step in servicing is to sectionalize the fault to a circuit of the power supply. The circuit at fault can be located by the following methods.

(1) *Visual inspection.* The purpose of visual inspection is to locate faults without testing or measuring circuits. Through inspection alone the repairman frequently may discover the trouble or determine the circuit in which the trouble exists.

(2) *Testing.* The tests described in this chapter frequently indicate the general location of the fault.

b. Localization. Once the circuit that is at fault has been determined, the trouble must be further localized to the defective component within the circuit. This can best be accomplished by isolation.

c. Isolation. The next step is to isolate the trouble to the defective part responsible for the abnormal condition. Equipment trouble can usually be isolated to dirty contacts or improper adjustment. Some faults, such as burned out resistors and arcing, can be located by means of sight, sound, or smell. The majority of faults, however, must be isolated by making voltage and resistance checks. Tests that should minimize the amount of work involved in isolating a trouble within a defective unit are contained in (1) through (4) below.

(1) *Visual inspection.* The purpose of visual inspection is to quickly locate a fault without testing or measuring circuits. By this approach, maintenance personnel can frequently discover the trouble or determine the circuit in which the trouble exists.

(2) *Testing.* Maintenance personnel should perform the tests located in this chapter. The tests will indicate the general location of the fault and help determine the exact nature of the trouble.

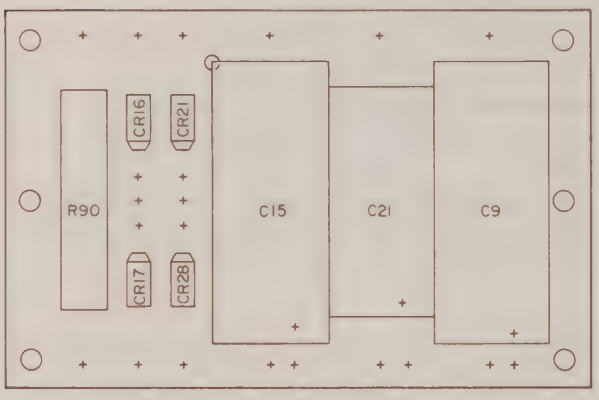
(3) *Intermittent troubles.* The possibility exists that intermittent troubles can occur. If present, this type of trouble can often be located by tapping or jarring the equipment. For this type of condition, the wiring and connections to the unit must be checked for defects.

(4) *Voltage and resistance measurements.*

When measuring voltages, use tape or sleeving to insulate the entire test probe, except for the extreme tip.

5-4. Maintenance Aids

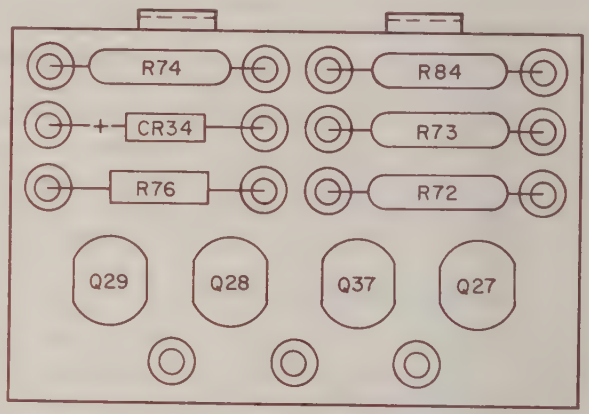
a. Parts Location Diagrams. Parts location diagrams (figs. 5-1 through 5-4 and 8-2) are provided for the power supply and to identify the individual components as an aid in troubleshooting.



NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATIONS WITH ASSEMBLY DESIGNATION A1.

EL 6130-247-15-1-TM-2

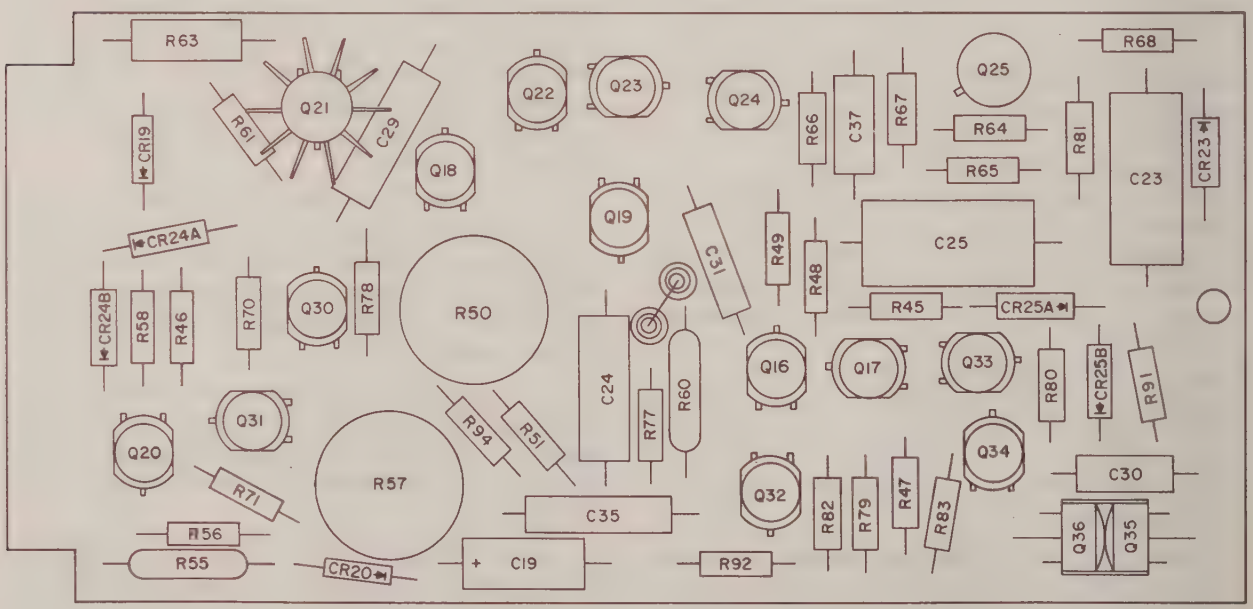
Figure 5-1. Power Supply PP-3940A/G, component board A1, parts location diagram.



NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATIONS WITH ASSEMBLY DESIGNATION A2.

EL 6130-247-15-1-TM-1

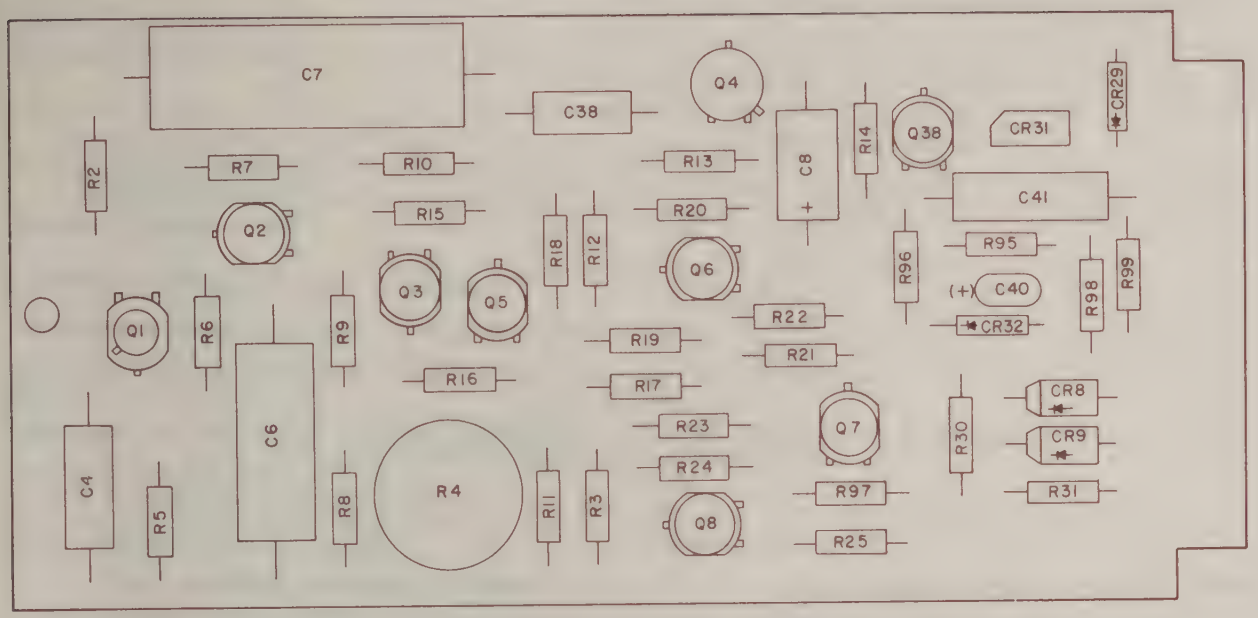
Figure 5-2. Power Supply PP-3940A/G, component board A2 parts location diagram.



NOTE:
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATIONS WITH ASSEMBLY DESIGNATION A3.

EL 6130-247-15-1-TM-4

Figure 5-3. Power Supply PP-3940A/G, component board A3, parts location diagram.



NOTE :
PARTIAL REFERENCE DESIGNATIONS ARE SHOWN. PREFIX THE DESIGNATIONS WITH ASSEMBLY DESIGNATION A4.

EL 6130-247-15-1-TM-3

Figure 5–4. Power Supply PP–3940A/G, component board A4, parts location diagram.

b. Schematic Diagrams. Figure 8–3 is a schematic diagram of the power supply.

c. Resistor and Capacitor Color Code Diagram. Figure 8–1 is the color code diagram for resistors, and capacitors. Figure 8–1 provides pertinent resistance, voltage rating, and tolerance information.

d. Troubleshooting Chart.

Malfunction	Probable cause	Corrective action
1. VOLT MODE and CUR MODE indicators not lit.	Defective lamp	Determine mode of operation and replace appropriate lamp.
2. Fuse F1 blown	*a.* Shorted diode in main rectifier CR1–CR4 *b.* Defective switching stage Q9 and Q10 *c.* Filter capacitor C1, C2, or C13 shorted *d.* Defective passing stage Q13, Q14 or Q15.	*a.* Replace defective diode. *b.* Replace defective component. *c.* Replace defective component. *d.* Replace defective component.
3. Low output or no output voltage.	*a.* Open PAR OPER, terminals (between pins 10 and 11 on TB1). *b.* Switch S1 defective *c.* Fuse F1 blown *d.* Defective switching stage Q9 and Q10 *e.* Defective Schmitt trigger A4Q5 and A4Q6. *f.* Defective transformer T1	*a.* Check wiring for open or loose link. *b.* Replace switch. *c.* See 2 above. *d.* Replace defective component. *e.* Replace defective component. *f.* Replace transformer.
4. High output voltage	*a.* Open SENSE connection *b.* Relaxation oscillator frequency adjust potentiometer A4R4 misadjusted. *c.* Defective Schmitt trigger A4Q5 and A4Q6.	*a.* Check wiring for open or loose link. *b.* Check oscillator frequency and adjust if required. *c.* Replace defective component.

d. Troubleshooting Chart—Cont.

Malfunction	Probable cause	Corrective action
	d. Voltage regulation circuits A3Q36, A3Q35, A3Q33, or A3Q32 defective.	*d.* Replace defective component.
	e. Defective VOLT ADJ potentiometer R59A or R59B.	*e.* Replace defective component.
	f. Preregulator control potentiometer A3R57 or amplifier A3Q20 defective.	*f.* Replace defective unit and readjust preregulator.
5. No current limiting	*a.* Loose connection at CUR PROG terminals.	*a.* Check and tighten if necessary.
	b. Defective CUR ADJ potentiometer R53A or R53B.	*b.* Replace defective component.
	c. Defective balance adjust potentiometer A3R50.	*c.* Replace defective component.
	d. Current regulation circuit A3Q18, A3Q19, A3Q16, or A3Q17 defective.	*d.* Replace defective component.
	e. Defective temperature compensation network A4Q38, A4C41, R28, or A4R99.	*e.* Replace defective component. *Note.* Overcurrent protection check (para 5–9) must be accomplished if A4Q38 or R28 is found to be defective.

5–5. Initial Settings for Adjustments

a. Remove screws holding one-piece top and side cover from power supply, exposing interior of power supply.

b. Set printed board potentiometers A4R4, A3R50, and A3R57 to their midpoint positions.

c. Set front panel CUR ADJ fine and coarse control potentiometers R53A and R53B and VOLT ADJ coarse and fine control potentiometers R59A and R59B to the midpoint position.

d. Set internal potentiometers R54 and R69 to their midpoint positions.

e. Be sure that terminal board links are connected as stated in paragraph 2–5*a*.

f. Connect load (variable resistor 5- to 50-ohm, 200-watt) to power supply front panel binding posts. Set variable resistor to midposition.

g. Connect power supply to variable power transformer (TF–171A/U).

h. Connect variable power transformers to the 115-volt, 1-phase, 60-Hz source. Adjust variable power transformer to 115-volt output as viewed on Multimeter TS–352B/U.

5–6. Preregulator and Reference Supply Adjustment

a. Set POWER switch S1 to ON and observe that POWER ON indicator and VOLT MODE lamp light.

b. Connect frequency counter (AN/USM–207-A) across resistor A4R7 and adjust potentiometer A4R4 to frequency of 4,000 Hertz ±400.

c. Gyptol potentiometer A4R4.

d. Remove frequency counter.

e. Connect oscilloscope (AN/USM–117) across resistor A4R25. Check for clean square wave driving pulse across entire duty cycle range. If pulse is not a clean square wave, troubleshoot components on circuit board A4.

f. Remove oscilloscope.

g. Place voltmeter (AN/GSM–64) across capacitor A3C23 and adjust potentiometer R69 so that voltmeter indicates 12.0 to 12.2 volts.

NOTE

Do not use Gyptol on potentiometer R69 at this time. Further adjustments are required.

h. Vary input line from 105 to 125 volts ac using variable power transformer. The regulation should be 0.5 millivolt or less.

i. Set CUR ADJ coarse and fine control potentiometers R53A and R53B and VOLT ADJ coarse and fine control potentiometers R59A and R59B maximum clockwise.

j. Connect voltmeter (AN/GSM–64) between terminal E2 and the junction of resistors R37 and R36.

k. Set A3R57 so that voltmeter indicates approximately 5 volts.

l. With the output voltage set to 40 volts dc and the input line set to 105 volts ac, gradually increase the load to full current output (4 amperes).

m. At this load setting, reset potentiometer A3R57 to 5.0 volts ±0.1.

n. Lock with Gyptol.

NOTE

If output current level cannot be reached, gradually and with caution adjust potentiometer R54 until proper output current is obtained.

5–7. Current Mode Range Adjustment

a. Set POWER switch S1 to off and insert an ammeter (multimeter, Weston Instruments Model 281) in series with the load.

b. Set CUR ADJ coarse and fine controls fully counterclockwise.

c. Set POWER switch S1 to ON and adjust potentiometer A3R50 as follows.

(1) Set potentiometer A3R50 until load current is set as close as possible to zero but some current is still indicated.

(2) Continue to turn potentiometer A3R50 1 or 2 wire turns further until meter indicates zero.

(3) Lock potentiometer A3R50 with Gyptol.

d. Set CUR ADJ coarse and fine control potentiometers R53A and R53B maximum clockwise, and adjust load to between 4.15 and 4.25 amperes. CUR MODE indicator DS3 should not light.

e. If CUR MODE indicator DS3 lights, rotate potentiometer R54 until VOLT MODE indicator lights and CUR MODE indicator extinguishes.

f. Readjust potentiometer R54 until CUR MODE indicator lights and current drops slightly (but remains within the 4.15- to 4.25-ampere range).

g. Lock with Gyptol.

5–8. Voltage Programing Adjustment

a. Set POWER switch S1 to off and remove load and ammeter.

b. Remove link between terminal board terminals 1 and 2 and insert Resistor, Decode ZM–16/U between terminals 1 and 3 (voltage programing), adjusting ZM–16/U for exactly 4,000 ohms.

c. Set POWER switch S1 to ON and adjust potentiometer R69 to give an output voltage of 40 volts dc ±0.20. This calibrates the voltage programing to 100 ohms/volt.

d. Turn the power off, remove ZM–16/U, and replace link between terminals 1 and 2.

e. Lock potentiometer R69 with Gyptol.

f. Apply input power and set VOLT ADJ coarse and fine control potentiometers maximum counterclockwise. Indicator should be 0 volt ±0.1.

5–9. Overcurrent Protection Network Adjustment

Perform the following whenever transistor A4-Q38 is replaced:

a. Set power supply POWER switch S1 to off and VOLT ADJ coarse and fine controls fully counterclockwise.

b. Connect load set at 5 ohms across terminals 4 and 5 on terminal board at rear of power supply.

c. Unsolder resistor A4R99 and remove transistor A3Q16 from its snap out socket.

d. Insert ZM–16/U in place of resistor A4R99 with an initial setting of approximately 100 ohms.

e. Set power supply POWER switch S1 to ON.

f. Slowly turn VOLT ADJ coarse and fine controls until the output current rises to 135 percent of the nominal value (5.4 amperes).

g. Adjust ZM–16/U until the power supply shuts off.

h. Set power supply POWER switch S1 to off. Insert the nearest standard resistor value for the ZM–16/U resistance reading (22 to 100 ohms).

i. Perform *e* and *f* above. Power supply should turn off when the current reaches 130 to 140 percent of nominal value (5.2 to 5.6 amperes).

j. Set power supply POWER switch S1 to off. Remove load and reinstall A3Q16.

CHAPTER 6

GENERAL SUPPORT TEST PROCEDURES

6-1. General

This chapter contains the necessary information to test the line and load regulation and ripple of the power supply. The information consists of test equipment required for testing the power supply, preliminary setup procedures to prepare the power supply for testing, and test procedures.

6-2. Test Equipment Required

a. Multimeter TS-352B/U.

b. Transformer, Variable Power TF-171A.

c. Voltmeter, Meter ME-30E/U.

d. Knife switch.

e. Multimeter, Weston Instruments Model 281.

f. Resistor, Decade ZM-16/U.

g. Voltmeter, Digital AN/GSM-64.

6-3. Preliminary Setup Procedures for Tests

a. Set power supply POWER switch to off.

b. Connect power supply line cord to TF-171A. Set TF-171A control fully counterclockwise.

c. Connect AN/GSM-64, ME-30E/U, ZM-16/U TS-352B/U, knife switch, and ammeter as shown in figure 6-1. (Be sure the links are connected securely between terminals 1 and 2, 3 and 4, 5 and 6, 8 and 9, and 10 and 11.)

d. Connect TF-171A to ac source.

e. Set knife switch to open position and adjust ZM-16/U for 10 ohms (load).

6-4. Voltage and Current Test

a. Adjust TF-171A control until TS-352B U indicates 115 volts ac.

b. Set power supply POWER switch S1 to ON and knife switch to closed position.

c. Set VOLT ADJ coarse and fine controls to indicate 40 volts dc on AN GSM-64. Power supply voltmeter M2 should indicate between 39.6 and 40.4 volts.

d. Adjust the CUR MODE coarse and fine controls to indicate 4 amperes on Multimeter, Weston Instruments model 281. Power supply ammeter M1 should indicate between 3.6 and 4.4 amperes. The ME-30E U should indicate less than 1 millivolt.

e. Adjust TF-171A control until TS-352B U indicates 125 volts ac. The AN GSM-64 should indicate between 39.96 and 40.04 volts.

f. Adjust TF-171A control until TS-352B U indicates 105 volts ac. The AN GSM-64 should indicate between 39.96 and 40.04 volts. Set power supply POWER switch S1 to off. Disconnect AN GSM-64, ME-30E U, Multimeter, Weston Instruments model 281, knife switch, and ZM-16 U from the power supply. Connect a number 18 wire from terminal 4 to terminal 5.

g. Set power supply POWER switch S1 to ON. Ammeter M1 should indicate between 3.6 and 4.4 amperes.

h. Set power supply POWER switch S1 to off and disconnect the equipment.

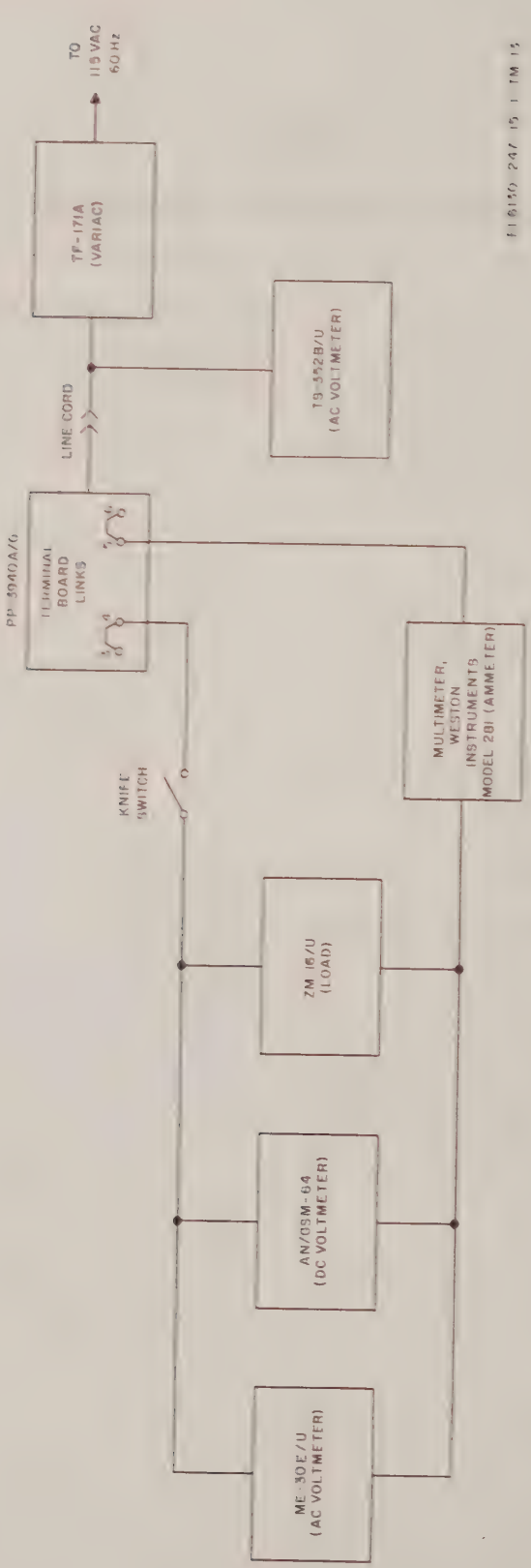


Figure 6-1. Test setup for voltage and current test.

CHAPTER 7

DEPOT OVERHAUL STANDARDS

7-1. Applicability of Depot Overhaul Standards

Tests outlined in this chapter are designed to measure the performance capability of a required equipment. Equipment that is to be returned to stock should meet standards given in these tests.

7-2. Applicable References

a. Repair Standards. Applicable procedures of depots which perform these tests, and the general standards for repaired electronic equipment given in TB SIG 355-1, TB SIG 355-2, and TB SIG 355-3 form a part of requirements for testing this equipment.

b. Modification Work Orders. Perform all modification work orders applicable to this equipment before making tests specified. DA Pam 310-7 lists all available MWO's.

7-3. Test Facilities Required

Items required for depot testing are the same as those given in paragraph 6-2.

7-4. Tests

The depot overhaul standards test procedures are the same as those given for general support (paras 6-3 and 6-4). Equipment that meets the performance standards stated in these tests will furnish satisfactory operation equivalent to that of new equipment.

CHAPTER 8

SHIPMENT, LIMITED STORAGE, AND DEMOLITION TO PREVENT ENEMY USE

8-1. Repackaging

Repackaging of equipment for shipment or limited storage normally will be performed at a packaging facility or by a repackaging team. Should emergency packaging be required, select the materials from those listed in SB 38-100. Package the equipment in accordance with the original packaging so far as possible, with the available materials.

8-2. Authority for Demolition

Demolition of the equipment will be accomplished only upon order of the commander. Use the destruction procedures outlined in paragraph 8-3 to prevent further use of the equipment.

8-3. Methods of Destruction

The tactical situation and time available will determine the method to be used when destruction of equipment is ordered. In most cases, it is perferable to demolish completely some portions of the equipment rather than partially destroy all of the equipment units.

a. Smash. Smash the cabinet, meters, controls, and the interior of the equipment.

b. Cut. Cut all cords and cables in a number of places.

WARNING

Be extremely careful with explosives and incendiary devices. Use these items only when the need is urgent.

c. Burn. Burn the technical manuals first. Burn as much of the equipment as is flammable.

d. Dispose. Bury or scatter destroyed parts or throw them into nearby waterways.

Figure 8-1. Color code marking for resistors, and capacitors.
[Located in back of manual]

Figure 8-2. Power Supply PP-3940A/G, chassis parts location diagram.
[Located in back of manual]

Figure 8-3. Power Supply PP-3940A/G, schematic diagram.
[Located in back of manual]

APPENDIX A

REFERENCES

DA Pam 310-4	Index of Technical Manuals, Technical Bulletins, Supply Manuals (Types 7, 8, and 9), Supply Bulletins, and Lubrication Orders.
DA Pam 310-7	U.S. Army Index of Modification Work Orders.
SB 38-100	Preservation, Packaging, Packing and Marking Materials, Supplies, and Equipment Used by the Army.
TB SIG 355-1	Depot Inspection Standard for Repaired Signal Equipment.
TB SIG 355-2	Depot Inspection Standard for Refinishing Repaired Signal Equipment.
TB SIG 355-3	Depot Inspection Standard for Moisture and Fungus Resistant Treatment.
TB 746-10	Field Instructions for Painting and Preserving Electronics Command Equipment.
TM 11-6625-203-12	Operator and Organizational Maintenance: Multimeter AN URM-105, including ME-77 U.
TM 11-6625-320-12	Operator and Organizational Maintenance Manual: Voltmeter, Meter ME-30A U and Voltmeters, Electronic ME-30B U, ME-30C U, and ME-30E U.
TM 11-6625-366-15	Organizational, DS, GS, and Depot Maintenance Manual: Multimeter TS-352B U.
TM 11-6625-444-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Digital Voltmeter AN GSM-64.
TM 11-6625-539-15-2	Operator, Organizational, DS, GS, and Depot Maintenance Manual including Repair Parts and Special Tool Lists: Test Set, Transistor TS-1836B U.
TM 11-6625-640-15	Operator, Organizational, DS, GS, and Depot Maintenance Manual: Oscilloscope AN/USM-117B.
TM 11-6625-700-10	Operator's Manual: Digital Readout, Electronic Counter AN USM-207.
TM 38-750	The Army Maintenance Management Systems (TAMMS).
TM 740-90-1	Administrative Storage of Equipment.

APPENDIX B

MAINTENANCE ALLOCATION

Section I. INTRODUCTION

B-1. General

This appendix provides a summary of the maintenance operations covered in the equipment literature. It authorizes categories of maintenance for specific maintenance functions on repairable items and components and the tools and equipment required to perform each function. This appendix may be used as an aid in planning maintenance operations.

B-2. Maintenance Functions

Maintenance functions will be limited to and defined as follows:

a. Inspect. To determine serviceability of an item by comparing its physical, mechanical, and electrical characteristics with established standards.

b. Test. To verify serviceability and to detect incipient electrical or mechanical failure by use of special equipment such as gages, meters, etc. This is accomplished with external test equipment and does not include operation of the equipment and operator type tests using internal meters or indicating devices.

c. Service. To clean, to preserve, to charge, and to add fuel, lubricants, cooling agents, and air. If it is desired that elements, such as painting and lubricating, be defined separately, they may be so listed.

d. Adjust. To rectify to the extent necessary to bring into proper operating range.

e. Align. To adjust two or more components or assemblies of an electrical or mechanical system so that their functions are properly synchronized. This does not include setting the frequency control knob of radio receivers or transmitters to the desired frequency.

f. Calibrate. To determine the corrections to be made in the readings of instruments or test equipment used in precise measurement. Consists of the comparison of two instruments, one of which is a certified standard of known accuracy, to detect and adjust any discrepancy in the accuracy of the instrument being compared with the certified standard.

g. Install. To set up for use in an operational environment such as an encampment, site, or vehicle.

h. Replace. To replace unserviceable items with serviceable like items.

i. Repair. To restore an item to serviceable condition through correction of a specific failure or unserviceable condition. This function includes, but is not limited to welding, grinding, riveting, straightening, and replacement of parts other than the trial and error replacement of running spare type items such as fuses, lamps, or electron tubes.

j. Overhaul. Normally, the highest degree of maintenance performed by the Army in order to minimize time work in process is consistent with quality and economy of operation. It consists of that maintenance necessary to restore an item to completely serviceable condition as prescribed by maintenance standards in technical publications for each item of equipment. Overhaul normally does not return an item to like new, zero mileage, or zero hour condition.

k. Rebuild. The highest degree of materiel maintenance. It consists of restoring equipment as nearly as possible to new condition in accordance with original manufacturing standards. Rebuild is performed only when required by operational considerations or other paramount factors and then only at the depot maintenance category. Rebuild reduces to zero the hours or miles the equipment, or component thereof, has been in use.

l. Symbols. The uppercase letter placed in the

appropriate column indicates the lowest level at which that particular maintenance function is to be performed.

B–3. Explanation of Format

a. Column 1, Group Number. Column 1 lists group numbers, the purpose of which is to identify components, assemblies, subassemblies, and modules with the next higher assembly.

b. Column 2, Functional Group. Column 2 lists the noun names of components, assemblies, subassemblies, and modules on which maintenance is authorized.

c. Column 3, Maintenance Functions. Column 3 lists the maintenance category at which performance of the specific maintenance function is authorized. Authorization to perform a function at any category also includes authorization to perform that function at higher categories. The codes used represent the various maintenance categories as follows:

Code	*Maintenance category*
C	Operator/crew
O	Organizational maintenance
F	Direct support maintenance
H	General support maintenance
D	Depot maintenance

d. Column 4, Tools and Test Equipment. Column 4 specifies, by code, those tools and test equipments required to perform the designated function. The numbers appearing in this column refer to specific tools and test equipments which are identified in table I.

e. Column 5, Remarks. Self-explanatory.

B–4. Explanation of Format of Table I, Tool and Test Equipment Requirements

The columns in Table I are as follows:

a. Tools and Equipment. The numbers in this column coincide with the numbers used in the *Tools and equipment* column of the applicable tool for the maintenance function.

b. Maintenance Category. The codes in this column indicate the maintenance category normally allocated the facility.

c. Nomenclature. This column lists tools, test, and maintenance equipment required to perform the maintenance functions.

d. Federal Stock Number. This column lists the Federal stock number of the specific tool or test equipment.

e. Tool Number. Not used.

SECTION II. MAINTENANCE ALLOCATION CHART

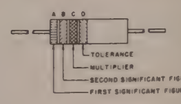
GROUP NUMBER	COMPONENT ASSEMBLY NOMENCLATURE	MAINTENANCE FUNCTIONS											TOOLS AND EQUIPMENT	REMARKS
		INSPECT	TEST	SERVICE	ADJUST	ALIGN	CALIBRATE	INSTALL	REPLACE	REPAIR	OVERHAUL	REBUILD		
	POWER SUPPLY PP-3940A/G	C O	O F H	C O	C F H				C F					Visual Clean Operational Running spares

TABLE I. TOOL AND TEST EQUIPMENT REQUIREMENTS

TOOLS AND EQUIPMENT	MAINTENANCE CATEGORY	NOMENCLATURE	FEDERAL STOCK NUMBER	TOOL NUMBER
1	H,D	MULTIMETER, WESTON INSTRUMENTS MODEL 281	6625-356-8306	
2	H,D	COUNTER, ELECTRONIC, DIGITAL READOUT AN/USM-207A	6625-044-3228	
3	O	MULTIMETER AN/URM-105	6625-581-2036	
4	F,H,D	MULTIMETER TS-352B/U	6625-553-0142	
5	H,D	OSCILLOSCOPE AN/USM-117	6625-787-0304	
6	F,H,D	RESISTOR, DECADE ZM-16/U	6625-669-0266	
7	F,H,D	RESISTOR, VARIABLE, WIREWOUND (0- to 7.5-OHM, 1,000 WATTS)	5905-195-4496	
8	F,H,D	TEST SET, TRANSISTOR TS-1836B/U	6625-168-0954	
9	F,H,D	TOOL KIT, ELECTRONIC EQUIPMENT TK-100/G	5180-605-0079	
10	O	TOOL KIT, ELECTRONIC EQUIPMENT TK-105/G	5180-610-8177	
11	F,H,D	TRANSFORMER, VARIABLE POWER TF-171A	5950-560-0632	
12	H,D	VOLTMETER, METER ME-30E/U	6625-643-1670	
13	H,D	VOLTMETER, DIGITAL AN/GSM-64	6625-870-2264	
14	H,D	SWITCH, KNIFE	5930-224-4928	

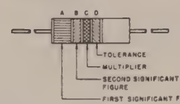
COLOR CODE MARKING FOR MILITARY STANDARD RESISTORS

COMPOSITION-TYPE RESISTORS



BAND A— Equal Width Band Signifies Composition-Type

WIREWOUND-TYPE RESISTORS

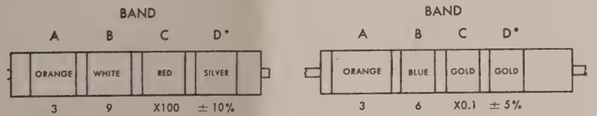


BAND A— Double Width Signifies Wire-wound Resistor

COLOR CODE TABLE

BAND A		BAND B		BAND C		BAND D*	
COLOR	FIRST SIGNIFICANT FIGURE	COLOR	SECOND SIGNIFICANT FIGURE	COLOR	MULTIPLIER	COLOR	RESISTANCE TOLERANCE (PERCENT)
BLACK	0	BLACK	0	BLACK	1		
BROWN	1	BROWN	1	BROWN	10		
RED	2	RED	2	RED	100		
ORANGE	3	ORANGE	3	ORANGE	1,000		
YELLOW	4	YELLOW	4	YELLOW	10,000	SILVER	± 10
GREEN	5	GREEN	5	GREEN	100,000	GOLD	± 5
BLUE	6	BLUE	6	BLUE	1,000,000		
PURPLE (VIOLET)	7	PURPLE (VIOLET)	7				
GRAY	8	GRAY	8	SILVER	0.01		
WHITE	9	WHITE	9	GOLD	0.1		

EXAMPLES OF COLOR CODING

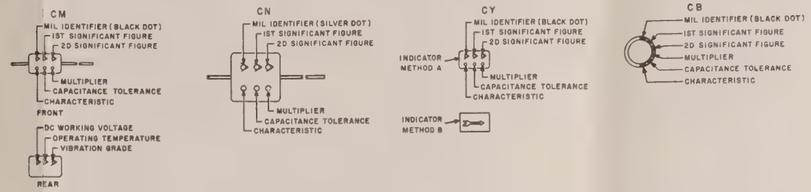


STD-R2

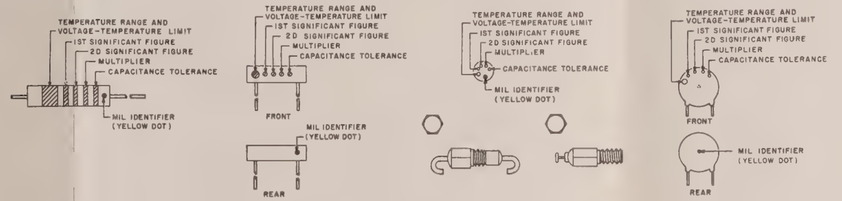
*If Band D is omitted, the resistor tolerance is ± 20%, and the resistor is not Mil-Std.

COLOR CODE MARKING FOR MILITARY STANDARD CAPACITORS

GROUP I Capacitors, Fixed, Various-Dielectrics, Styles CM, CN, CY, and CB



GROUP II Capacitors, Fixed Ceramic-Dielectric (General Purpose) Style CK



GROUP III Capacitors, Fixed, Ceramic-Dieletric (Temperature Compensating) Style CC

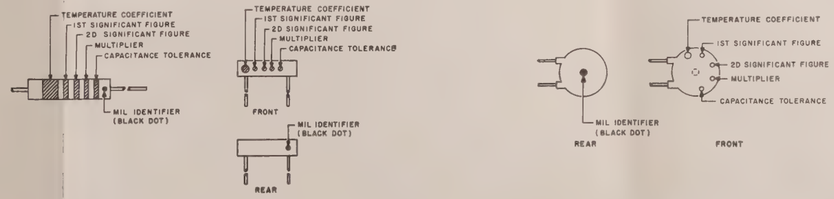


Figure 8-1. Color code marking for resistors and capacitors.

COLOR CODE TABLES

TABLE I – For use with Group I, Styles CM, CN, CY and CB

COLOR	MIL ID	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE				CHARACTERISTIC[2]				DC WORKING VOLTAGE	OPERATING TEMP. RANGE	VIBRATION GRADE
					CM	CN	CY	CB	CM	CN	CY	CB	CM	CM	CM
BLACK	CM, CY CB	0	0	1			± 20%	± 20%		A				−55° to +70°C	10–55 cps
BROWN		1	1	10						B	E	B			
RED		2	2	100	± 2%		± 2%	± 2%	C			C		−55° to +85°C	
ORANGE		3	3	1,000		± 30%			D			D	300		
YELLOW		4	4	10,000					E					−55° to +125°C	10–2,000 cps
GREEN		5	5		± 5%				F				500		
BLUE		6	6											−55° to +150°C	
PURPLE (VIOLET)		7	7												
GREY		8	8												
WHITE		9	9												
GOLD				0.1			± 5%	± 5%							
SILVER	CN				± 10%	± 10%	± 10%	± 10%							

TABLE II – For use with Group II, General Purpose, Style CK

COLOR	TEMP. RANGE AND VOLTAGE – TEMP. LIMITS[3]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE	MIL ID
BLACK		0	0	1	± 20%	
BROWN	AW	1	1	10	± 10%	
RED	AX	2	2	100		
ORANGE	BX	3	3	1,000		
YELLOW	AV	4	4	10,000		CK
GREEN	CZ	5	5			
BLUE	BV	6	6			
PURPLE (VIOLET)		7	7			
GREY		8	8			
WHITE		9	9			
GOLD						
SILVER						

TABLE III – For use with Group III, Temperature Compensating, Style CC

COLOR	TEMPERATURE COEFFICIENT[4]	1st SIG FIG	2nd SIG FIG	MULTIPLIER[1]	CAPACITANCE TOLERANCE		MIL ID
					Capacitances over 10uuf	Capacitances 10uuf or less	
BLACK	0	0	0	1		± 2.0uuf	CC
BROWN	−30	1	1	10	± 1%		
RED	−80	2	2	100	± 2%	± 0.25uuf	
ORANGE	−150	3	3	1,000			
YELLOW	−220	4	4				
GREEN	−330	5	5		± 5%	± 0.5uuf	
BLUE	−470	6	6				
PURPLE (VIOLET)	−750	7	7				
GREY		8	8	0.01			
WHITE		9	9	0.1	± 10%		
GOLD	+100					± 1.0uuf	
SILVER							

1. The multiplier is the number by which the two significant (SIG) figures are multiplied to obtain the capacitance in uuf.
2. Letters indicate the Characteristics designated in applicable specifications: MIL–C–5, MIL–C–91, MIL–C–11272, and MIL–C–10950 respectively.
3. Letters indicate the temperature range and voltage-temperature limits designated in MIL–C–11015.
4. Temperature coefficient in parts per million per degree centigrade.

STD–C2

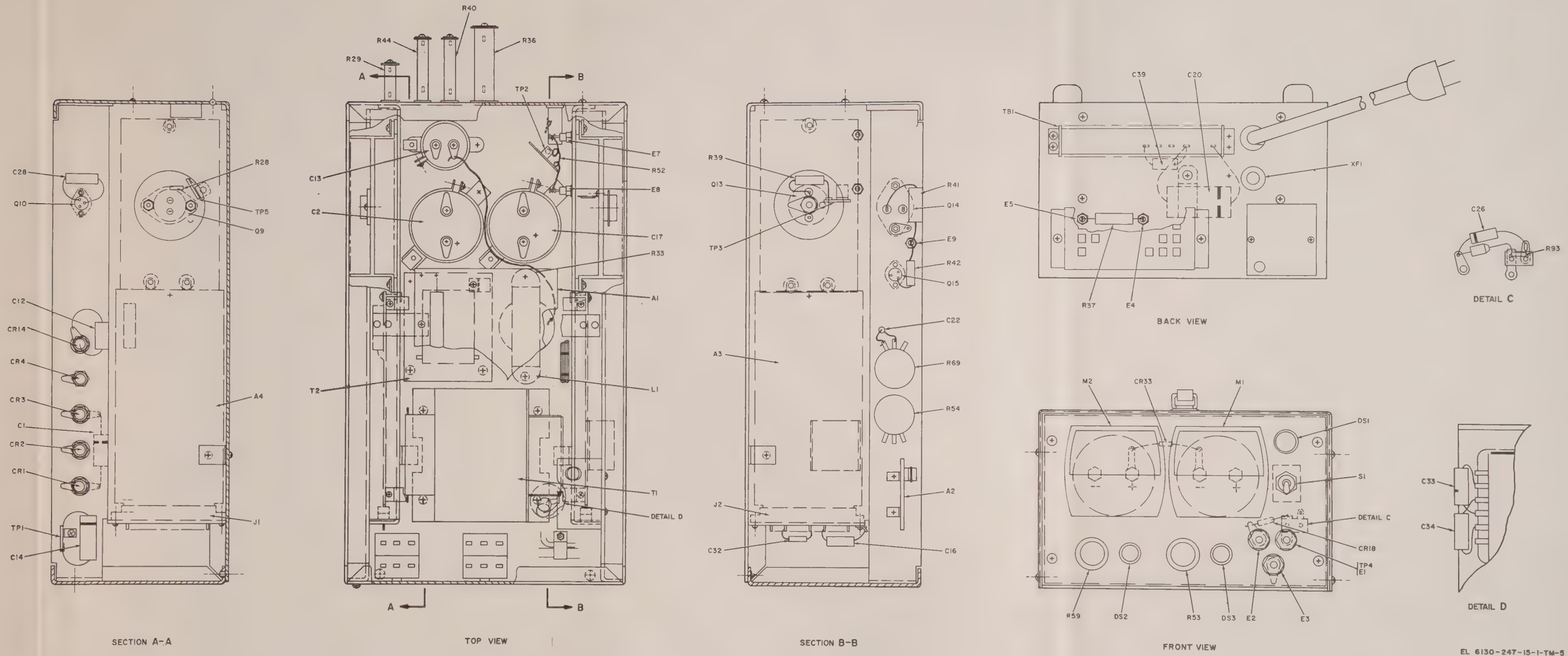


Figure 8-2. Power Supply PP-3940A/G, chassis parts location diagram.

EL 6130-247-15-1-TM-5

By Order of the Secretary of the Army:

W. C. WESTMORELAND
General, United States Army,
Chief of Staff.

OFFICIAL:
VERNE L. BOWERS
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